

SECTION 15845

AIR TERMINALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Single-duct air terminals.
 - 2. Fan-powered air terminals.
- B. Related Sections include the following:
 - 1. Division 15, Section 15106, "Chilled Water, Condenser water, Cooling Tower Water, Heating Hot Water, Condensate and Process Water Piping, including Hydronic Specialties".
 - 2. Division 15, Section 15250, "Mechanical Insulation"
 - 3. Division 15, Section 15891, "Ductwork"
 - 4. Division 15, Section 15950, "Direct Digital Control System" –CLO Building only.
 - 5. Division 15, Section 15960, "Laboratory Airflow Control Systems" –CLO Building only.
 - 6. Division 17, "Instrumentation and Controls" (All applicable Sections).

1.3 REFERENCES

- A. American Refrigeration Institute (ARI):
 - 1. ARI 410 (1991) Forced Circulation Air-Cooling and Air-heating Coils.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 (1996) National Electrical code.
 - 2. NFPA 90A (1996) Installation of Air Conditioning and Ventilating Systems.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA 250 Control Panel Enclosure Classifications.
- D. Occupational Safety and Health Administration (OSHA):
 - 1. OSHA 1910.7 Listing & Labeling Agency Qualifications.
- E. Underwriters Laboratory (UL):
 - 1. UL 181 250 Control Panel Enclosure Classifications.
 - 2. UL 486A (1997) Standard for Safety Wire Connectors for use with Aluminum conductors.
 - 3. UL 486B (1997) Standard for Safety Wire Connectors and Soldering Lugs for use with Copper conductors.

1.4 SUBMITTALS

- C. Product Data: Include performance data, rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model indicated. Include a schedule showing drawing designation, room location, number furnished, model number, size, and accessories furnished.

- D. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, and method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
- E. Maintenance Data: List of parts for each type of air terminal and troubleshooting maintenance guide to include in the maintenance manuals specified in General and Supplementary Conditions.

1.3 QUALITY ASSURANCE

- A. Product Options: Drawings and schedules indicate requirements of air terminals and are based on specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered.
- B. Listing and Labeling: Provide electrically operated air terminals specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- C. NFPA Compliance: Install air terminals according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- D. Comply with NFPA 70 for electrical components and installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering air terminals that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Envirotech.
 - 2. Titus.
 - 3. Trane Co. (The).

2.2 SINGLE-DUCT AIR TERMINALS

- A. Configuration: Volume-damper assembly inside unit casing. Locate control components inside protective metal shroud.
- B. Casings: Steel or aluminum sheet metal of the following minimum thicknesses:
 - 1. Upstream Pressure Side: 0.0239-inch (0.6-mm) steel.
 - 2. Downstream Pressure Side: 0.0179-inch (0.45-mm) steel.
 - 3. Upstream Pressure Side: 0.032-inch (0.8-mm) aluminum.
 - 4. Downstream Pressure Side: 0.025-inch (0.63-mm) aluminum.
- C. Casing Lining: Minimum of 1/2-inch- (13-mm-) thick, neoprene- or vinyl-coated, fibrous-glass insulation; 1.5-lb/cu. ft. (24-kg/cu. m) density, complying with NFPA 90A requirements and UL 181 erosion requirements. Secure lining to prevent delamination, sagging, or settling.
 - 1. Cover lining with perforated metal.
 - 2. Cover perforated metal with Mylar film.

- D. Plenum Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
- E. Plenum Air Outlets: S-slip and drive connections.
- F. Access: Removable panels to permit access to dampers and other parts requiring service, adjustment, or maintenance, with airtight gasket and quarter-turn latches.
- G. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: 2 percent of nominal airflow at **3-inch wg (750-Pa)** inlet static pressure.
 - 2. Maximum Damper Leakage: 3 percent of nominal airflow at **6-inch wg (1,500-Pa)** inlet static pressure.
 - 3. Damper Position: Normally open.
- H. Attenuator Section: Line with **2-inch- (50-mm-)** thick, neoprene- or vinyl-coated, fibrous-glass insulation.
- I. Multi-outlet Attenuator Section: With **6-inch- (150-mm-)** diameter collars, each with locking butterfly-balancing damper.
- J. Hot-Water Heating Coil: ARI rated and certified; **1/2-inch (13-mm)** copper tube, mechanically expanded into aluminum-plate fins; leak tested underwater to **200 psig (1,380 kPa)**; and factory installed.
- K. Controls: Damper operator, and other devices compatible with temperature controls specified in Division 17, and for the CLO specifically in Division 15, Section 15950, "DDC Systems". Coordinate all actuator and control interfaces with Divisions 15 and 17. Terminal box shall be provided with integral airflow monitoring such that it is pressure independent.

2.3 FAN-POWERED AIR TERMINALS

- A. Configuration: Volume-damper assembly and fan in series or in parallel arrangement inside unit casing. Locate control components inside protective metal shroud.
- B. Casings: Steel or aluminum sheet metal of the following minimum thicknesses:
 - 1. Upstream Pressure Side: **0.0239-inch (0.6-mm)** steel.
 - 2. Downstream Pressure Side: **0.0179-inch (0.45-mm)** steel.
 - 3. Upstream Pressure Side: **0.032-inch (0.8-mm)** aluminum.
 - 4. Downstream Pressure Side: **0.025-inch (0.63-mm)** aluminum.
- C. Casing Lining: Minimum of **1/2-inch- (13-mm-)** thick, neoprene- or vinyl-coated, fibrous-glass insulation; **1.5-lb/cu. ft. (24-kg/cu. m)** density, complying with NFPA 90A requirements and UL 181 erosion requirements. Secure lining to prevent delamination, sagging, or settling.
 - 1. Cover lining with perforated metal.
 - 2. Cover perforated metal with Mylar film.
- D. Plenum Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
- E. Plenum Air Outlets: S-slip and drive connections.

- F. Access: Removable panels to permit access to dampers and other parts requiring service, adjustment, or maintenance, with airtight gasket and quarter-turn latches.
- G. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: 2 percent of nominal airflow at 3-inch wg (750-Pa) inlet static pressure.
 - 2. Maximum Damper Leakage: 3 percent of nominal airflow at 6-inch wg (1,500-Pa) inlet static pressure.
 - 3. Damper Position: Normally open.
- H. Fan Section: Galvanized-steel plenum, acoustically lined, housing direct-drive, forward-curved fan with permanent split-capacitor motor, air filter, and back-draft damper.
 - 1. Speed Control: Infinitely adjustable manual electronic controls mounted on the terminal unit housing.
 - 2. Isolation: Fan-motor assembly on rubber isolators.
- I. Attenuator Section: Line with 2-inch- (50-mm-) thick, neoprene- or vinyl-coated, fibrous-glass insulation.
- J. Hot-Water Heating Coil: 1/2-inch (13-mm) copper tube, mechanically expanded into aluminum-plate fins; leak tested underwater to 200 psig (1,380 kPa); and factory installed.
- K. Factory-mounted and -wired controls: Mount electrical components in control box with removable cover. Incorporate single-point electrical connection to power source.
 - 1. Factory-mounted transformer for electric components with terminal strip in control box for field wiring of power source.
 - 2. Wiring Terminations: Fan to terminal strip, and terminal lugs to match quantities, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box sized according to NFPA 70.
 - 3. Disconnect Switch: Factory-mounted, fused, disconnect switch.
- L. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit. Provide control relay for remote activation of fan unit.
- M. Controls: Coordinate all actuator and control interfaces with Divisions 15 (CLO only) and 17. Terminal box shall be provided with integral airflow monitoring such that it is pressure dependent.

2.4 SOURCE QUALITY CONTROL

- A. Testing Requirements: Test and rate air terminals according to ARI 880, "Industry Standard for Air Terminals."
- B. Identification: Label each air terminal with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install air terminals level and plumb, according to manufacturer's written instructions, rough-in drawings, original design, and referenced standards; and maintain sufficient clearance for normal service and maintenance.

- B. Connect ductwork to air terminals according to Division 15, Section 15891, "Ductwork".

3.2 CONNECTIONS

- A. Install piping adjacent to air terminals to allow service and maintenance.
- B. Hot-Water Piping: In addition to requirements in Division 15, Section 15106 that is applicable to Heating Hot Water Piping, connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return piping with balancing valve and union or flange.
- C. Electrical: Comply with applicable requirements in Division 16 Sections.
- D. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

3.5 COMMISSIONING

- A. Verify that installation of each air terminal is according to the Contract Documents.
- B. Check that inlet duct connections are as recommended by air terminal manufacturer to achieve proper performance.
- C. Check that controls and control enclosure are accessible.
- D. Verify that control connections are complete.
- E. Check that nameplate and identification tag are visible.
- F. Verify that controls respond to inputs as specified.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
 - 1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
 - 2. Review data in the maintenance manuals. Refer to General and Supplementary Conditions.
 - 3. Schedule training of Owner personnel, through Construction Manager, with at least 7 days' advanced notice.

END OF SECTION 15845